## KARNATAK UNIVERSITY DHARWAD



This is to certify that the M.Sc., project work dissertation entitled " Number Theory and its Application" submitted by Reg.No.19S14127 : Miss Soumya. C. Sugar of fourth semester M.Sc. in Mathematics course to the Karnatak University, Dharwad for the award of the degree of M.Sc., in Mathematics, is a result of M.Sc., project work carried out by her under my guidance. This project is submitted in partial fulfillment of the requirement for the award of Master's Degree in Mathematics during the academic year 2020-2021.

Place: Dharwad


Project Guide
Dr. (Smt.) Asha. S.K
Dr. ASHA. S.K. Asst. Professor
Dept. of Mathematics
KXatikinneversity, Dharwad

Date:02/08|2021


Prof. H. S. Ramane CHAIRMAN
Department of Mathematics Karnatak University, DHARWAD-580 003
1)


# KARNATAKA UNIVERSITY, DHARWAD 

## Department of Mathematics



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University with Potential for Excellence
Date: 30-7-2021

## CERTIFICATE

This is to certify that the M. Sc. Project work dissertation entitled "GRAPH THEORY" submitted to the Karnataka University, Dharwad by Miss. SOUMYA MUNNOLI as a partial fulfillment for the award of the degree of Master of Science in Mathematics represents her project work and it has not been submitted previously, for the award of any other degree or diploma of this or any other University or Institution. She has carried out this project work at the P.G. Department of Mathematics, Karnataka University, Dharwad under my supervision and Guidance.



Department of Mathematics, Karnataka University, Dharwad

CHAIRMAN
Department of Mathematics
Karnatak University, DHARWAD-580 003

# KARNATAK UNIVERSITY, DHARWAD 

Department Of Mathematics
 Date:

## CERTIFICATE

This is to certify that the M. Sc. project work dissertation entitled "Numerical Methods" submitted to the Karnatak University, Dharwad by Miss. Soumya Patil (19S14129) as a partial fulfilment for the award of the Degree of Master of Science in Mathematics represents her project work and it has not been submitted previously, for the award of any other degree or diploma of this or any other University or Institution. She has carried out this project work at the P. G. Department of Mathematics, Karnatak University, Dharwad, under my supervision and guidance.


Dr. ASH ATO S. K.
Projetsef Brofessor
Repat of Mathematics
Karnatak Unversity, Dharwad

Examiners:
1.
2.


# KARNATAK UNIVERSITY, DHARWAD 

## Department of Mathematics



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University with Potential for Excellence

## CERTIFICATE

Examination Reg.No.:
Date:

This is to certify that the M.Sc. project work dissertion called "LINEAR ALGEBRA THROUGH MATRICES" Submitted to the Karnatak University, Dharwad by Miss. Sushma Hegde as a partial fulfillment for the award of the Degree of Master of Science in Mathematics represents her project work and it has not been submitted previously,for the award of any other degree or diploma of this or any other university or Institution. She has carried outthis project work at the P.G.Department of Mathematics, Karnatak University, Dharwad under my supervision and guidance.


Departop̂t of Ririffernafics
Karnatatak innicersity, Tharadad.

-Chairman
Department of Mathematics
Karnatak University, Dharwad. CHAIRMAN Jepartment of Mathematics Karnatak University, DHARWAD-580 003

Examiners
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# KARNATAK UNIVERSITY, DHARWAD Department of Mathematics 



Re-Accrediated by NAAC 'A' Grade University with Potential for Excellence

Date:

## CERTIFICATE

This is to certify that the M.Sc. project work Dissertation entitled "BESSEL'S DIFFERENTIAL EQUATION" submitted to the Karnatak University, Dharwad by Miss. Swati .B.Demagondanvar as a partial for the fulfilment for the award of this or any other degree or diploma of this or any other University or Institution. She has carried out this project work at the P.G. Department of Mathematics, Karnatak University, Dharwad under my supervision and guidance.


Karnatak University, Dharwad



Chairman
CHAiRMAN Wannetar Undvematics . $)$ U nt University, Karnatak Universitos dofarwad

# KARNATAK UNIVERSITY, DHARWAD Department of Mathematics 



Date: 3010712021

## Certificate

This is to certify that the M.Sc. project work dissertation entitled "GOLDEN RATIO" submitted to the Karnatak University, Dharwad by Miss. Swati Josh as a partial fulfilment for the award of the Degree of Master of Science in Mathematics represents her project work and it has not been submitted previously, for the award of any other degree or diploma of this or any other University or Institution. She has carried out this project work at the P.G. Department of Mathematics, Kamatak University, Dharwad, under my supervision and guidance,
 Project Guide Dparthogyf Aathmetics Karnatek deneqerity of harwad Dept of Mathematics Kametak University, Dherwad Examiners:
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Department of Mathematic: DepactumbabNathatintles Karnataht diversity, Dhifluad

# KARNATAKA UNIVERSITY, DHARWAD 

Department of Mathematics


Re-accredited by NAAC 'A' Grade University with Potential for Excellence

Date: 30-7-2021

## CERTIFICATE

This is to certify that the M. Sc. Project work dissertation entitled "GRAPH THEORY" submitted to the Karnataka University, Dharwad by Miss, THRIVENI.Y.N. as a partial fulfillment for the award of the degree of Master of Science in Mathematics represents her project work and it has not been submitted previously, for the award of any other degree or diploma of this or any other University or Institution. She has carried out this project work at the P.G. Department of Mathematics, Karnataka University, Dharwad under my supervision and Guidance.
 Examiners:
1)
2)




Department of Mathematics, Karnataka University, Dharwad CHAIRMAN Department of Mathematics Karnatak University, OHARANAD-580 003

## KARNATAK UNIVERSITY, DHARWAD

## Department of Mathematics



Re-accredited by NAAC 'A' Grade University with Potential for Excellence

Date: 30-7-2021

## CERTIFICATE

This is to certify that the M.Sc project work dissertation entitled " NUMERICAL OPTIMIZATION" submitted to Department of Mathematics, Karnatak University, Dharwad by Mr. Tilak Krishna Moger and Mr. Vijayraj S. Kamble as a partial fulfillment for the award of degree of Master of science in mathematics and it has not been submitted previously, for the award of any degree or diploma of this or any other University or Institution. They have carried out this project work at the department of studies and research in Mathematics, Karnatak University, Dharwad under my supervision and guidance.

Dr. (Smt.) ASHAS. K.
Projet ehthe S: $\mathfrak{K}$.
Assteppyr
Departyeentatintatheymatiogad Karnatak University, Dharwad


Dr.H.S. Ramane Chairman
Department of Mathematics
Karnatak University, Dharwad
CHAIRMAN
Department of Mathematics Karnatak University, DHARWAD-580 003

Examiners:
1.
2.


## KARNATAK UNIVERSITY DHARWAD



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University with Potential for Excellence

## P. G. DEPARTMENT ŌF MATHEMATICS

 CERTIFICATEThis is to certify that the M.Sc., project work dissertation entitled "LAPLACE TRANSFORMS AND ITS APPLICATIONS" submitted by Reg.No.19S14135: Miss.Ujama.N.Patil of fourth semester M.Sc. in Mathematics course to the Karnatak University, Dharwad for the award of the degree of M.Sc., in Mathematics, is a result of M.Sc., project work carried out by her under my guidance. This project is submitted in partial fulfillment of the requirement for the award of Master's Degree in Mathematics during the academic year 2020-2021.

Place: Dharwad


Prof. Asha.S.K
Dr. ASHA. S. K.
Asst. Professor
Dept. of Mathematics
Kamatak University, Dharwad

Date: 2-8-2021

<br>Prof. H. S. Ramane CHAIRMAN<br>Department of Mathemacics Karnatak University, DHARWAD-580 003

Examiners:-

KARNATAK UNIVERSITY, DHARWAD

Dr. (Emt). Asha.S.K. Professor
Department of Mathematics

Pavate Nagar, Dharwad-580 003
Karnataka, India
Phone: 0836-221522(O)

Date: 2-8-2021

## CERTIFICATE

This is to certify that the M. Sc. project work dissertation entitled "Linear

Algebra" submitted to the Karnatak University, Dharwad by Miss. Vidyashri S
Gouda (19S14136) as a partial fulfilment for the award of Degree of Master of

Science in Mathematics represents their project work and it has not been
submitted previously, for the award of any other degree or diploma of this or any other
University or Institution. They have carried out this project work at the P. G.
Department of Mathematics, Karnatak University,Dharwad, under my supervision and guidance.


Project Guider. ASMA. 5.M.
Department of Maktempticithematics Karnatak Univepint, ff whwaid Dharma Karnatak

Examiners:


Department of Mathematics Karnatak University, Dharwad CHAIRMAN
Department of Mathematics Karnatak University, DHARWAD-580 003

# KARNATAK UNIVERSITY DHARIVAD 

Department of Mathematics


Re-accredited by NAAC "A" Grade
University with Potential for Excellence

Date: $2-8-2021$

## CERTIFICATE

This is to certify that the M. Sc. Project work dissertation entitled "FOURIER ANALYSIS AND IT'S APPLICATIONS" submitted to the Karnatak University, Dharwad By Miss. YasminSaiyad as a partial fulfillment for the award of the Degree of Master of Science in Mathematics represents her project work and it has not been previously, for the award of any degree or diploma or any other University or Institution. She has carried out this project work at the P.G. Department of Mathematics, Karnatak University, Dharwad Under my supervision and guidance.
 Project guidasst. Professor Dept of Mathematics
 Karnatakuniversity, Dharwad

Examiners:


Department of Mathematics
Karnatak University, Dharwad CHAIRMAN
Department of Mathematics Karnatak University, OHARWAD-580 603
1)
2)


# KARNATAK UNIVERSITY DHARWAD 



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## P. G. DEPARTMENT OF MATHEMATICS <br> CERTIFICATE

This is to certify that the M.Sc., project work dissertation entitled "PI : GEOMETRIC ASTONISHMENT" submitted by Reg.No.19S14059: Miss. Aishwarya.V.Yaligar and Reg.No.19S14058: Miss.Aishwarya of fourth semester M.Sc. in Mathematics course to the Karnatak University, Dharwad for the award of the degree of M.Sc., in Mathematics, is a result of M.Sc., project work carried out by them under my guidance. This project is submittedin partial fulfillment of the requirement for the award of Master's Degree in Mathematics during the academic year 2020-2021.

Place: Dharwad

Project Guide
Prof. B. Basavanagoud

Date: 31.7.21


Chairman
Prof. H. S. Ramane CHAIRMAN Department of Mathematics

Karnatak University,
DHARWAD-580 003

## Examiners:-

KARNATAK UNIVERSITY, DHARWAD

Pavate Nagar, Dharwad-580 003
Kamataka, India
Phone: 0836-221522(O)

## Chairman

Department of Mathematics
Date: 30-07-2021

## CERTWICATE

This is to certify that the M. Sc. project work dissertation entitled "e: The Scientific Base" submitted to the Karnatak University, Dharwad by Miss. Akshata R. Met (19S14060) as a partial fulfilment for the award of Degree of Master of Science in Mathematics represents their project work and it has not been submitted previously, for the award of any other degree or diploma of this or any other University or Institution. They have carried out this project work at the P. G. Department of Mathematics, Karnatak University, Dharwad, under my supervision and guidance.


Dr. B. Basavanagoud
Project Guide
Department of Mathematics
Karnatak University, Dharwad

Examiners:
1.
2.

## KARNATAK UNIVERSITY, DHARWAD

| Dr.II.S.Ramane <br> Chairman <br> Department of Mathematics | Pavate Nagar, Dharwad-580 003 <br> Karnataka, India <br> Phone: 0836-221522(0) |
| :--- | :--- |

## CERTHEICATE

This is to certify that the M. Sc. project work dissertation entitled "e:The Scientific Base" submitted to the Karnatak University, Dharwad by Miss. Ankita S. Kotyal (19S14061) as a partial fulfilment for the award of Degree of Master of Science in Mathematics represents their project work and it has not been submitted previously, for the award of any other degree or diploma of this or any other University or Institution. They have carried out this project work at the P. G. Department of Mathematics, Karnatak University, Dharwad, under my supervision and guidance.

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& \text { Dr. B. Basavanagoud } 30.721 \\
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& \text { Karnatak University, Dharwad }
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Examiners:


Department of Mathematics Karnatak University, Dharwad CHARMAN
Department of Mathematics
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# KARNATAKUNIVERSITY DHARWVAD 



## DEPARTMENT OF MATHEMATICS

## CERTIFICATE

This is to certify that Ms.ARALI NIKITA SHIVALINGAPPA and ARPITHA K .P, IV semester, M.Sc(Mathematics) has worked on the project entitled "i:Imaginary, but Can't ignore it" under my supervision and guidance.

## Place: Dharwad

Date : 30/07/2021

# KARNATAK UNIVERSITY DHARWAD 



## DEPARTMENT OF MATHEMATICS

## CERTIFICATE

This is to certify that Ms. ATIKA KARIGAR, IV semester, M.Sc (Mathematics) has worked on the project entitled "EULER'S IDENTITY" under my supervision and guidance.

Place : Dhomad
Date : 31/07/2021
B. Basavamagouff 31.7 .21
(Dr. B. BASAVANAGOUD) Professor Department of Mathematics Karnatak University Dharwad-580 003


## CHAIRMAN

Department of Mathematics


## KARNATAK UNIVERSITY DHARWAD

## DEPARTMENT OF MATHEMATICS

## CERTIFICATE

This is to certify that Ms.CHAITRA KAMALAKAR SHET, IV semester, M.Sc (Mathematics) has worked on the project entitled "SYSTEM OF NON-LINEAR DIFFERENTIAL EQUATIONS"under my supervision and guidance.

$$
\text { B. Basuvanaguef } 30.7 .21
$$

Place: Dharwad
Date : 30-07-2021
 OHARWAD-580 003

# KARNATAK UNIVERSITY <br> DHARWAD 



## DEPARTMENT OF MATHEMATICS

## CERTIFICATE

This is to certify that Ms.DARSHANA GOWDA, IV semester, M.Sc (Mathematics) has worked on the project entitled "NUMERICAL METHODS"under my supervision and guidance.

## Place: Dharwad

Date : 30-07-2021


Department of Mathemsuice
Karnatak University,
r.4AN.TAD-580 003

# KARNATAK UNIVERSITY DHARWAD 



## DEPARTMENT OF MATHEMATICS

## CERTIFICATE

This is to certify that Ms.DEEPA MADIVALAR, IV semester, M.Sc (Mathematics) has worked on the project entitled "EULER'S FORMULA AND ITS APPLICATION" under my supervision and guidance.

## Place: Dharwad

Date : 30-07-2021

## B. Basavanagoud

(Dr. B. BASAVANAGOUD)
Professor
Department of
Mathematics
Karnatak University
Dharwad-580 003

Department of Mathomatics Karnatak Úniversity,
DHARWAD-580 003

# KARNATAK UNIVERSITY DHARWAD 



## DEPARTMENT OF MATHEMATICS

## CERTIFICATE

This is to certify that Mr. GANESH PUJAR IV semester, M.Sc (Mathematics) has worked on the project entitled " VECTOR SPACE
"under my supervision and guidance.
Reg Nos-19514069

Place: DHRWAD
Date : 29/7/21

## B. Basavamagoul $\underset{\text { - } 29.7 .21}{2}$

(Dr. B. BASAVANAGOUD)
Professor
Department of Mathematics
Karnatak University
Dharwad-580 003

KARNATAK UNIVERSITY, DHARWAD

Dr.H.S.Ramane
Chairman
Department of Mathematics

Pavate Nagar, Dharwad-580 003
Karnataka, India
Phone: 0836-221522(O)

Date: $30107 / 2021$

## CERTIFICATE

This is to certify that the M. Sc. project work dissertation entitled "Ordinary Differential equation" submitted to the Karnatak University, Dharwad by Miss. Lavanya Shivappa Kadadi (19S14081) as a partial fulfilment for the award of Degree of Master of Science in Mathematics represents their project work and it has not been submitted previously, for the award of any other degree or diploma of this or any other University or Institution. They have carried out this project work at the P. G. Department of Mathematics, Karnatak University, Dharwad, under my supervision and guidance.


P5 H Ramanamane Project Guide MASc., M.D., PGDIM Departmentrof AAathematics
 Ramatak University, Dharwad -580003. India

Examiners:

2.


## KARNATAK UNIVERSITY DHARWAD

## CERTIFICATE

This is to certify that, the M.Sc project work dissertation entitled "FIBONACCI SEQUENCE \& IT'S APPLICATIONS" submitted to the Karnatak University, Dharwad by Mr. MANJUNATH H. TALAWAR and Mr. NAVEENA F. MANASHETTY as partial fulfilment for the award of the degree of Master of Science in Mathematics and it has not been submitted previously, for the award of any other degree or diploma of this or any other university or institution. They have carried out this project work at the department of Mathematics, Karnatak University, Dharwad, under my supervision and guidance.

Place: Dharwad
Date:


Dr. H. S. RAMANE
Dr. Mrgfessora Ma NE
Department of Matheitititieg, PM
Kamatak professor Dharwad Karnatak University,
Dharwad-580003. India

## Examiners:

1. 


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Departrôtiabin Mathematics,
 Kaphatak University, AHARWAD-580 003


KARNATAKA UNIVERSITY
DHARWAD

Dr.H S Ramane Dharwad-580003
Chairman
Department of Mathematics
Karnataka, India
Phone: 0836-221522(0)

CERTIFICATE
This is to certify that the M.Sc. project work dissertation entitled "Elliptical Differential Equation" submitted to the Karnataka University, Dharwad by Miss. Laxmi M Hattimani (Reg.No:19S14082) as a partial fulfilment for the award of the Degree of Master of Science in Riathematicsrepresents his project work and it has not been submitted previously, for the award ofay other degree or diploma of this or any other University or Instiverivit, She has worried out this project work at the P. G. Department of Mathematics, Ramataka University, Dharwad, under my supervision and guidance.


DIS RAM AR RAMA NE
 Project Guidpofessor Deracterneme of © dathefmenticsics Karnataknatakudpiterqingrwad Dharwad . 580003 india

Examiners:
1.

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## KARNATAK UNIVERSITY DHARWAD



Re-accredited by NAAC 'A' Grade University with Potential for Excellence

## P. G. DEPARTMENT OF MATHEMATICS

## CERTIFICATE

This is to certify that the M.Sc., project work dissertation entitled"GRAPH THEORY AND ITS APPRCATIONS"submitted by us Miss.
 (Reg.No.19S14088) of fourth set w io in Mathematics course to the Karnataka University, Dharwitaty, hard of the degree of MASc. in Mathematics, is a result of MASc., project work carried out by them under my guidance. This project is submitted in partial fulfillment of the requirement for the award of Master's Degree in Mathematics during the academic year 2020-2021.

Place: Dharwad
Date: 2-8-2821
$\qquad$ Herr Prof.H.S.Ramapir H.S RAMANE M. Sc., PhD., PGDMM Professor
Examiners:1) Kamatak University, 580003 India 2)

## KARNATAK UNIVERSITY, DHARWAD

##  <br> Re-accredited by NAAC 'A' Grade <br> University with Potential for Excellence <br> P. G. DEPARTMENT OF MATHEMATICS <br> CERTIFICATE

This is to certify that the M.Sc., project work dissertation entitled "Numerical Analysis" submitted by Reg.No.19S14086: Miss.Manasa Naik and Reg.No. 19 S14089 Miss. Mehreen Hansi of fourth semester M.Sc. in Mathematics course to the Karnatak University, Dharwad for the award of the degree of M.Sc., in Mathematics, is a result of M.Sc., project work carried out by her under my guidance. This project is submitted in partial fulfillment of the requirement for the award of Master's Degree in Mathematics during the academic year 2020-2021.

Place: Dharwad
Date: $31 / 07 / 2021$

KARNATAK UNIVERSITY DHARWAD

CERTIFICATE

This is to certify that, the M.Sc project work dissertation entitled "CANONICAL FORMS OF MATRICES" submitted to the Karnatak University, Dharwad by Mr. MAHESHAGOUDA and Mr. MALLAPPA MELLIKERI as partial fulfilment for the award of the degree of Master of Science in Mathematics and it has not been submitted previously, for the award of any other degree or diploma of this or any other university or institution. They have carried out this project work at the department of Mathematics, Karnatak University, Dharwad, under my supervision and guidance.

Place: Dharwad
Date:30-7-2021


Dr. H. S. RAMANE
Di. AR PROPANE Professor
Departmentofikthenametics

Oharwabe - 580003, ind iá

Examiners:
1.

2.

# KARNATAK UNIVERSITY, DHARWAD <br> "University with Potential for Excellence" <br> Accredited by NAAC with 'A' Grade 



## DEPARTMENT OF MATHEMATICS

## Certificate

This is to certify that the dissertation entitled "Group Actions And Applications" submitted to the Department of Mathematics, Karnatak University, Dharwad, is satisfactorily completed by Miss Nam rata Prasad Phadke for the partial fulfillment of the requirement for the award of the Degree of Master of Science in Mathematics during the academic year 2020-2021.


Dr. H.S. Ramane
Project Guide and The Chairman Department of Mathematics Karnatak

EhampadAN
Department of Mathematics
Karnatak University,
DHARWAD-590 003
Place: Dharwad
Date: 30-07-2021
Examiners:

2.

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Ir. PG. Pant
Professor
Department nf Mathernatics

## KARNATAK UNIVERSITY, DHARWAD

Dits: 30.07 .2021

## CERTIFICATE

This is to certify that the M. Sc. project work dissertation entitled "APPLICATIONS OF VECTOR SPACE" submitted to the Karnatak University, Dharwad by Mr. Naveen Shanlurappa Salian (19814092) and Mr. Praveen Ishwarappa Kerimani (19S14101) as a partial fulfillment for the award of Degree of Master of Science in Mathematics represents their project work and it has not been submitted previously, for the award of any other degree or diploma of this or any other University or Institution. They have carried out this project work at the $P$. G Department of Mathematics, Karnatak University, Dharwad, under my supervision and guidance.

Dr. PGENTI $3 \times 107(50 \%)$ OT. P. G. PKTIL MSE, Phi. D.
Project (guide Professor Department of Methemuting hematic Kamatak Univensif: Dilalroy sill

## Examiners:

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## KARNATAK UNIVERSITY, DHARWAD

Dr. P. G. Patil
Protersmr
Department of Mutheruatics

Pavale Nagar, Dhurwad-580003 Karnatakn, India
Phote 0836-221522(0)

Date 3 ! $\boldsymbol{x}_{1}^{1}, 20.21$

## CERTIFICATE

This is to certify that the M. Sc. project work tissertation entiterl "Non-linear partial differeatial equations" submitted to the Kumatak Universily, I harwed by Miss. Pallavi Salunke (19814197)and Miss. Pooja Randewadi (19514ing) as a partial fulfiment for the award of Degree ui Master of Science in Mathenatics represents their prajest work and it hos not heas. subvitred provisusly, for the ewned of any othe degrex: in diploma of this of any ouber Ihiversity or Institurim. Trey have carried out this project wark at the I. G. Deparmeat of Mathemetice, Karnatak University, Dharwad, under my supervision and guidance:
DL.P. csard Dr: 2407 PATIL

## Projeet Guide <br> M.55., Fh. D.

Prolessor
Department of \$othomplies Mathematics
Karnatak Univerinjs blhatwed erstry
Dharwatl-580 c03, Indis.


Decrurlutent of Mathematics Karnatak Lenturgify, Dharwad Uepartment of Mattiematics Karnatak University.
DH: Gven 520 nos

## Examincrs:



## KARNATAK UNIVERSITY, DHARWAD

Pavate Nagar, Dharwad-5500033
Kamataka, india
Phene: 0836-221522(0)

Date: 20.07-2025

## CERTIFICATL

This is to cerfify that the MSis projzit work dissarlation enciled "IUPOLOGICAI. VECTOR SPACES" summitid to the Karnutuk Chiversily Dharwad by Miss, $P$ ANHISHA (19S14094) Miss, PALLAVI IRS ULALJ.ER (19514096) and Miss. POORNIMA BASAVARI.I KARIIOLI (19S14099) us a partial fulfilment for the award of Degres on Master of Science in Mathemutio represents their project work and it has not been sulnnitted previuusly, ior the uward of amy anmer defree or diplema of this or anv ander Uriversily or institution They have carricd out this profect wark at the P. G IVerkutment of Vlullematics, Finnatak University, Dharwad, undel Ity supervision time guidarce.

Dr ruchintio $301072-21$
ProiREGiPdeG. PATIL Departmentof MartheraiPleso. Dimatuat Protessor Dibarawithent of Harthovratics Kar aitakidrikensive phitywad Dharwad-580003, India.


Depulacnt pf hldathematics
Kamatainem of mothersitic.
Dhiseverack Universty,
DHARMAD-5ED 003

Examiners:


## KARNATAK UNIVERSITY, DHAHWAD

Dr. P, G. Patis<br>Professon<br>Department of Marhematics

Pavat: Naymr, Dharwad-580003
Karnalaka, Irdin.
Phane: 0836-221522(0)

Datc. $36 / 7 / 21$

## CERTLELCSTE

This is to certify that the M. Sc. pruect woik dissertation entitied = COMPACT SPACES " submitted to the Kamatnk Universily, Dharwad by Miss. Noorain Changapur (19S14093)und Miss. Padmarani Padasalagi (19814095) as a partial fulfiluent for the opari of Degree of Master of Science in Mathematice tepresents their projut worls and i: has not been submited previously, for the award of miy ofler degrec us diplema of this or aty oulher University ar Institution. They have curcued out tinis project work at the P. G. Lheparment of Mothematics, Kamalak Ohiversity, Dharwad under my supervision and guidanse.


Examiners:


## KARNATAK UNIVERSITY, DHARWAD

Dr. P. G. Patio<br>Karmataka, India<br>Department of Mathematics

Payate Nagar, Dharwad-580 003 Professor
Phone: $01836-221522(0)$

Date 3010712021

## CEKLIEICATE

This is to certify that the M.Sc. project work dissertation entitled "FUZZY NUMBERS" submitted to the Karnatak University, Dharwad by Miss. PRATLBHA METI (19S14100) and Mivs.PREETI KALAKORI (19S14102) as a partial fulfilment for the award of Degree of Master of Science in Mathematics represents their project work and it has not been submitted previously, for the award of any other degree or diploma of this or any other University or Institution. They have carried out this project work at the P.G. Department of Mathematics, Karnatak University, Lharwad, under my supervision and guidance.

Dr.P.C. 12012020
Project Guide
DepatmenDof ManthenatidATIL
Kamatak University, Dhatised. Ph. D.
Department of Mathematics
Karnatak University
Examinerbharwad 40003 , India.
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## KARNATAK UNIVERSITY DHARWAD

## CERTIFICATE

This is to certify that the M.Sc. project work dissertation entitled "LAPLACE TRANSFORM AND ITS APPLICATIONS" submitted to Department of Mathematics, Karnatak University Dharwad by MS. LALITA MADIWALASHIVAYOGI ADAMANI, MS. GURUDEVI SHIVANAND KAPANUR and MS. KUNJARANI TELI as a partial fulfillment for the award of degree of Master of Science in Mathematics and it has not been submitted previously, for the award of any other degree or diploma of this or any other University or Institution. They have carried out this project work at the. Department of Mathematics, Karnatak University, Dharwad under my supervision and guidance.

Place: Dharwad
Date: 30-07-2021

Examiners:


## KARNATAK UNIVERSITY DHARWAD

## CERTIFICATE

This is to certify that, the M.Sc project work dissertation entitled "PARTIAL DIFFERENTIAL EQUATION AND ITS APPLICATIONS" submitted to Karnatak University, Dharwad by Ms. GOURI JAKKAPPA JALAPUR (Reg.No. 19S14073) and Ms. KAVITA ANGADI (Reg. No. 19S14078) as a partial fulfillment for the award of the degree of Master of Science in Mathematics represents their project work and it has not been submitted previously, for the award of any other degree or diploma of this or any other University or Institution. They have carried out this project work at the Department of Studies in Mathematics, Karnatak University, Dharwad, under constant support and immense guidance of Dr. P. M. Patil, Department of Mathematics, Karnatak University, Dharwad during academic year 2020-21.

Dr. P. M. Patil
DProject guide TIL Department of Matheinatics, Karnatak Uniyersitgen Dharwad.



## Chairman

Department of Mathematics, Karnatak University, Dharwad. CHAIRMAN
Department of Mathematics Karnatak University.


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## DEPARTMENT OF MATHEMATICS

## Certificate

This is to certify that the dissertation entitled "Boundary Value Problems In Rectangular Coordinates" submitted to the Department of Mathematics, Kamatak University, Dharwad, is satisfactorily completed by Mr. Javid Aqtar I. Shaikh and Mr. Kalakamalleshwar D for the partial fulfillment of the requirement for the award of the Degree of Master of Science in Mathematics during the academic year 2020-



Dr. F. S. Ramane
The Chairman
Department of Mathematics Departmkatnatak dhiverstycs

Karnatak University.
DHARWAPhastado3

## Examiners:

1. 
2. 



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## P. G. DEPARTMENT OF MATHEMATICS KARNATAKA UNIVERSITY, DHARWAD

## CERTIFICATE

This is to certify that the M.Sc., project work dissertation entitled "GREEN'S FUNCTIONS WITH APPLICATIONS" submitted by, Mr. GIREESH M SINDHOOR and Mr. GIREESH PUJARI of fourth semester M.Sc. in Mathematics course to the Karnatak University, Dharwad for the award of the degree of M.Sc. in Mathematics, is a result of M.Sc., project work carried out by them under my guidance. This project is submitted in partial fulfillment of the requirement for the award of Master's Degree in Mathematics during the academic year 2020-2021.

Place: Dharwad Date:


Department of Maffematics Karnataka Knuyersity, Dhantiad Dharwad-580 003, India.
Examiners:-


## Dr. R.S. Ramane

Chairman $A$ Department of Mathematies Karnatakarnityersity Dhamwad DHARWAD-550 003

## KARNATAK UNIVERSITY, DHARWAD



## Certificate

This is to certify that the M.Sc project work dissertation entitled "NUMERICAL METHODS FOR DIFFERENTLAL EQUATION" submitted to department of Mathematics, Karnataka University, Dharwad by Miss. Geeta B. Kalappanavar and Miss. Jyoti Choukashi as a partial fulfillment for the award of degree of Master of Science in Mathematics and it has not been submitted previously, for the award of any other degree or diploma of this or any other University or Institution. She has carried out this project work at the Department of Mathematics, Karnataka University, Dharwad under my supervision and guidance.

Place : Dharwad


Chairman:
Dr. P.M.Patil

 Professor
Department of Mathematics


Dr. CARMan Dept inatematics Karnatak en tor at nematic Rarnatak University. DHARWAD-580 003


## KARNATAK UNIVERSITY DHARWAD



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## P. G. DEPARTMENT OF MATHEMATICS

## CERTIFICATE

This is to certify that the M.Sc., project work dissertation entitled "DIFFERENTIATION AND IT'S APPLICATIONS" submitted by Miss. SEEMA. R. MORAB (Reg.No.19514118), Miss. SHILPA (19S14122), Miss. Shweta. D. Bhajantri (19S14124) of fourth semester M.Sc. in Mathematics course to the Karnatak University, Dharwad for the award of the degree of M.Sc. in Mathematics, is a result of M.Sc., project work carried out by her under my guidance. This project is submitted in partial fulfillment of the requirement for the award of Master's Degree in Mathematics during the academic year 2020-2021.

## Place: Dharwad

Date: 30-7-2021

Brojgat Mudde yavanal Dr (Spat) (Rer) 8: ©9atathal Dopartment of Mainemsedat.D Karnatak University, Dhawad-03 Examiners:-


Chairman

## Prof.CHARRamane

Department of Mathema Karnatak University, DHARWAD-580 003

1) R.S. Dyaranal-RCD 2)

# KARNATAK UNIVERSITY DHARWAD 

Dr. (emt) R. S. Dyavanal.<br>Professor<br>Department of Mathematics KUD

Pavate Nagar, Dharwad-580003
Karnataka, India
Phone:0836-221522(O)

Date: 0210812021

## CERTIFICATE

This is to certify that the M. Sc. project work dissertation entitled "Numerical Methods" submitted to the Karnatak University, Dharwad by Miss.Shwetha.S.Janagi.(Reg.No.19S14125),Miss.Shankarevva.M.Hunasheekatti( Reg.No.19S14121) and Miss.Seetha Bai.G.(Reg.No.19S14119) as a partial fulfilment for the award of Degree of Master of Science in Mathematics represents their project work and it has not been submitted previously, for the award of any other degree or diploma of this or any other University or Institution. He/She has carried out this project work at the P. G. Department of Mathematics, Karnatak University, Dharwad, under my supervision and guidance.


Dr. (mt) R. S. Dyavanal.
Project Guide
Department of Mathematics
Kamatak University, Dharwad


Examiners:

1. R.S.Dyavanal - ReD $718 / 2021$
2. 

## KARNATAK UNIVERSITY, DHARWAD

## Department of Mathematics

<br>Re-accredited by NACC 'A' Grade<br>University with potential for Excellence

Date: 30/07/2021

## CERTIFICATE

This is to certify that the M. Sc. project work dissertation entitled "GRAPH THEORY AND ITS APPLICATIONS" submitted to the Karnatak University, Dharwad by Sangeeta Hosamani(Reg.No.19S14116), Sanjana K Janjalli(Reg.No.19S14117)and Smeeta I Kuriyavar(Reg.No.19S14126) as a partial fulfilment for the award of Degree of Master of Science in Mathematics represents their project work and it has not been submitted previously, for the award of any other degree or diploma of this or any other University or Institution. She has carried out this project work at the P. G. Department of Mathematics, Karnatak University, Dharwad, under my supervision and guidance.


Dr.(smt)R.S.Dyavanal Project Guide


Kanatak Universities So harwad Department of Mathematics Karnatak University, Dharwad-03


Department of Mathematics
Karnatak University ${ }_{\text {A }}^{\text {Dharwad }}$
Department of Mathematics Karnatak University DHARWAD-580 003

Examiners:

1. R.S. Dyavanal - RED 7/8/2021
2. 



## P. G. DEPARTMENT OF MATHEMATICS KARNATAK UNIVERSITY, DHARWAD

## CERTIFICATE

This is to certify that the M.Sc., project work dissertation entitled "DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS" submitted by, Mr. SANGAM MADABHAVI, Mr. SHREENATHA and Mr. SHANKARANAND of fourth semester M.Sc. in Mathematics course to the Karnatak University, Dharwad for the award of the degree of M.Sc. in Mathematics, is a result of M.Sc., project work carried out by them under my guidance. This project is submitted in partial fulfillment of the requirement for the award of Master's Degree in Mathematics during the academic year 2020-2021.

Place: Dharwad
Date: 30-07-2021


Dr.(Smt) R.
Or. (SArtresbon Dy ava Departuibherff $N$ afficinatics
 Karmatait University,

Examiners:-

Dr.II.S. Ramane
Chairman Department of Mathematics Karnatak University, Dharwad CHAIRMAN Department of Mathematics Karnatak University, 1) R.S. Dyavanal-RCD 7/8/2021
2)

## KARNATAK UNIVERSITY DHARWAD



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## P.G.DEPARTMENT OF MATHEMATICS



This is to certify that the M.Sc., project work dissertation entitled "A study of wavelets, Daubechies wavelet based numerical method for the solution of volterra integral equation of second kind and applications of wavelets in Electronics"submitted by Reg.No.19S14103 Mr.Punitraj of fourth semester M.Sc. in Mathematics course to the Karnatak University, Dharwad for the award of the degree of M.Sc., in Mathematics, is a result of M.Sc., project work carried out by him under my guidance. This project is submitted in partial fulfillment of the requirement for the award of Master's Degree in Mathematics during the academic year 2020-2021.

## Place: Dharwad <br> Date:

## Project Guide

Prof. S. C. Shiralashetti
Dr. S. C. SHIRALASHETTI
H.SC, PGDCAMAPhU. PhD.

Professor
Department of Mathematics
Karlevaminigremwak 580003

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 Karnatak University. DHARWAD-580 003
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## P. G. DEPARTMENT OF MATHEMATICS



This is to certify that the M.Sc., project work dissertation entitled "A STUDY OF WAVELETS, COIFMAN WAVELET BASED NUMERICAL METHOD FOR THE SOLUTION OF LINEAR VOLTERRA INTEGRAL EQUATIONS AND APPLICATIONS OF WAVELETS IN WIDEBAND SCATTERING AND ENVIRONMENTAL IMAGING" submitted by Reg. No. 19S14104: Miss. R. PRAVALLIKA of fourth semester M.Sc. in Mathematics course to the Karnatak University, Dharwad for the award of the degree of M.Sc., in Mathematics, is a result of M.Sc., project work carried out by her under my guidance. This project is submitted in partial fulfillment of the requirement for the award of Master's Degree in Mathematics during the academic year 2020-2021.
Place: Dharwad

## Project Guide

Prof. S. C. Shiralashetti
Dr. S. C. SHIRALASHETTI
M.SC., PGDCAM.Phill.Ph.D.

Examinact psor
Pppartment of Mathematics
Karfatak University, Dharwadsgege0s

Chairman

Prof. H.S. Ramane CHAIRMAN Department of Mathemetics Karnatak University, DHARWAD-580 003)

## KARNATAK UNIVERSITY DHARWAD



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This is to certify that the M.Sc. project work dissertation entitled "A study of wavelets, spline wavelet based method for the study of areal rough surfaces and application of wavelets in statistical estimation" submitted by: Miss. R Shreedevi (Reg.No.19S14105) of fourth semester M.Sc. in Mathematics course to the Karnatak University, Dharwad for the award of the degree of M.Sc. in Mathematics, is a result of M.Sc. project work carried out by her under my guidance. This project is submitted in partial fulfillment of the requirement for the award of Master's Degree in Mathematics during the academic year 2020-2021

Place: Dharwad

Project Guide
Prof. S. C. Shiralashetti
Dr.S. C. SHIRALASHETII
Misc. PGOGAM.PTH., Ph LD.
Professor
Popartmont of Mathematics $\mathrm{K}=\mathrm{x}$ a
1)

Prof S.C. Shrralashetti 年 $7 / 812021$

## KARNATAK UNIVERSITY DHARWAD



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## CERTIFICATE

This is to certify that the M.Sc., project work dissertation entitled "A study of wavelets, Haar wavelet based lifting scheme for microprocessor and VLSI applications and Applications of wavelets in physics" submitted by Reg.No.19S14106: Miss. Radha Timmanna Hegde of fourth semester M.Sc. in Mathematics course to the Karnatak University, Dharwad for the award of the degree of M.Sc., in Mathematics, is a result of M.Sc., project work carried out by her under my guidance. This project is submitted in partial fulfilment of the requirement for the award of Master's Degree in Mathematics during the academic year 2020-2021.

Place: Dharwad

Project Guide
Prof. S. C. Shiralashetti
Dr. S. C. SHIRALASHETTI
M.SC, PGDCAM.Phid.,Ph.D.

Professor
EPaportmert:of Mathematics
Ky ${ }^{\text {Kazak University, Dharwad-580003 }}$

Date: 03/08/2021


Prof. H. S. Ramane CHAIRMAN
Department of Mathematics Karnatak University, DHARNAD-580 003
2)

Prof S.C. Shrralashetto $\frac{8}{8}$

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University with Potential for Excellence
P. G. DEPARTMENT OF MATHEMATICS


This is to certify that M.Sc., Project dissertation entitled "A study of Wavelets, Chebyshev wavelet Based Numerical Method to Solve Integral Equations And Applications of Wavelets in Chemistry". Submitted by Reg. No-19S14107:
Mr. Raghavendra Dilleppa Kurivavar of fourth semester M. Sc in Mathematics to the Karnatak University, Dharwad for the award of the Degree of M.Sc., in Mathematics, is a result of M. Sc., Project work carried out by him under my guidance. This Project is Submitted in partial fulfilment of the requirement for the award Of Master's Degree in Mathematics during the academic year 2020-2021.

Place: Dharwad


Prof. S. C. Shiralashetti
Dr. S. C, SHIRALASHETTI

Examinêrsfoss or
Department of Mathematics
Karate) University, Qharwad-580003

## Date:



Chairman:

## Dr. H S. Ramane

CHAIRMAN Department of Mathematics Karnatak University,
2) DHARWAD-580 003


## KARNATAK UNIVERSITY DHARWAD



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## P.G.DEPARTMENT OF MATHEMATICS



This is to certify that the M.Sc., project work dissertation entitled "A Study of Wavelets, Multiwavelets based numerical solution of Integral equation and applications of wavelets in chemical engineering" submitted by Reg.No.19S14108: Mr.Raju Dodamani of fourth semester M.Sc. in Mathematics course to the Karnatak University, Dharwad for the award of the degree of M.Sc., in Mathematics, is a result of M.Sc., project work carried out by him under my guidance. This project is submitted in partial fulfillment of the requirement for the award of Master's Degree in Mathematics during the academic year 2020-2021.

Place: Dharwad
Date:

## Project Guide

Prof. S. C. Shiralashetti Dr. S. C. SHIRALASHETTI
M.SC, PGDCAMM.PhI.,Ph.D. Professor
Examingerssispathematics
K ap) tai University, Dhanwad- 580003


Shrralashet oo
Prof.dHARRAMANe
Department of Mathematics Karnatak University.
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## P. G. DEPARTMENT OF MATHEMATICS

## CERTIFICATE

This is to certify that the M.Sc., project work dissertation entitled "A Study of Wavelets, Wilson wavelet based numerical technique for the solution of differential equations and Applications of Wavelets in power system" submitted by Reg.No.19S14109: Miss. Rashmi Adrushayya Hiremath of fourth semester M.Sc. in Mathematics course to the Karnatak University, Dharwad for the award of the degree of M.Sc., in Mathematics, is a result of M.Sc., project work carried out by her under my guidance. This project is submitted in partial fulfillment of the requirement for the award of Master's Degree in Mathematics during the academic year 2020-2021.

Place: Dharwad


Prof. S. C. Shiralashetti
Dr. S. C. SHHRALASHETTI
相:SC, PGDCAM.PhH.PhD.
Professor
Bxambiverssifthematics
K.7patak University, Dhanwad-580003

Date: 0410812021


Chairman

Prof. H. S. Ramane

CHAIRMAN
Department of Mathematic Karnatak University, DHARWAD-580 003

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## P. G. DEPARTMENT OF MATHEMATICS



This is to certify that the M.Sc., project work dissertation entitled " $\mathbf{A}$ study of Wavelets, Lucas Wavelet Based Numerical Method to Solve differential equations and Applications of Wavelets in Civil Engineering" submitted by Reg.No.19S14110: Miss. Rekha Shantageri of fourth semester M.Sc. in Mathematics course to the Karnatak University, Dharwad for the award of the degree of M.Sc., in Mathematics, is a result of M.Sc., project work carried out by her under my guidance. This project is submitted in partial fulfillment of the requirement for the award of Master's Degree in Mathematics during the academic year 2020-2021.

Place: Dharwad

Project Guide
Prof. S. C. Shiralashetti
Dr. S. C. SHIRALASHETTI
MSC, PGDCAM.PhH.,PhD.
Professor
Department of Mathematics


## Date:



Chairman
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Karnatak Mathematics Karnatak University,
DHARWAD-580 003
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## KARNATAK UNIVERSITY DHARWAD



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## CERTIFICATE

This is to certify that the M.Sc., project work dissertation entitled "A Study of Wavelets, Chebyshev wavelet based numerical technique for the solution of differential equations and applications of wavelets in Geosciences" submitted by Reg.No.19S14111: Miss. Renuka_Ramachandra Hoonkali of fourth semester M.Sc. in Mathematics course to the Karnatak University, Dharwad for the award of the degree of M.Sc., in Mathematics, is a result of M.Sc., project work carried out by her under my guidance. This project is submitted in partial fulfillment of the requirement for the award of Master's Degree in Mathematics during the academic year 2020-2021.

Place: Dharwad

Project Guide
Prof. S. C. Shiralashetti
Dr. S. C. SHIRALASHETTI
3. SC. PGDCAM.PhH.Ph.D.

Professor
Expmainemstathematics Kame fiat University, Dharwad-580003

Date: 0410812021


Chairman
Prof. H. S. Ramane

## CHAIRMAN

Department of Mathemati Karnatak University, DHARWAD-580 003,


## KARNATAK UNIVERSITY DHARWAD



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## P. G. DEPARTMENT OF MATHEMATICS



This is to certify that the M.Sc., project work dissertation entitled "A Study of Wavelets, Haar Wavelet Based Method for the Solution of Nonlinear Volterra Integral Equations of First Kind and Applications of Wavelets in Biology" submitted by Reg. No. 19S14112: Miss. Reshma. K. Korishettar of fourth semester M.Sc. in Mathematics course to the Karnatak University, Dharwad for the award of the degree of M.Sc., in Mathematics, is a result of M.Sc., project work carried out by her under my guidance. This project is submitted in partial fulfillment of the requirement for the award of Master's Degree in Mathematics during the academic year 2020-2021.

Place: Dharwad Date: 6-8-21


Prof. S. C. Shiralashetti Dr. S. C. SHIRALASHETTI
M.SC, PGDCAM.PhWI.PhLD.

Professor
Examainevestathematics ${ }^{K} 1$ pratak University, Dharwad-580003


Prof. H. S. Ramane
CHAIRMAN Department of Mathematics Karnatak University, DHARWAD-580 003
2) 2) -

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\begin{aligned}
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& \text { University with Potential for Excellence } \\
& \text { P. G. DEPARTMENT OF MATHEMATICS } \\
& \text { CERTIFICATE }
\end{aligned}
$$

This is to certify that the M.Sc., project work dissertation entitled "A study of Wavelets, An application of Daubechies wavelets in signal processing and an application of Daubechies wavelets in Image processing" submitted by Reg.No.19S14113: Miss. Reshma Kadakol of fourth semester M.Sc. in Mathematics course to the Karnatak University, Dharwad for the award of the degree of M.Sc., in Mathematics, is a result of M.Sc., project work carried out by her under my guidance. This project is submitted in partial fulfillment of the requirement for the award of Master's Degree in Mathematics during the academic year 2020-2021.

Place: Dharwad


Project Guide
Prof. S. C. Shiralashetti
Dr. S. C. SHIRALASHETTI
m. Sc., PGDCA,M.PhII.,Ph.D.

Professor
Fyeminifeorstathematics Ky yak University, Dharwad-580003

Date: 0210812021

## Chairman

Prof. H. S. Ramane CHAIRMAN Department of Mathematics Karnatak University, DHARWMn.5On 003

Prof $S$-c. Shiralashets

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7(8) 2021
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# KARNATAK UNIVERSITY DHARWAD 



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## P. G. DEPARTMENT OF MATHEMATICS

## CERTIFICATE

This is to certify that the M.Sc., project work dissertation entitled "A STUDY OF WAVELETS, CHEBYSHEV WAVELET BASED NUMERICAL METHOD FOR THE SOLUTION OF INTEGRO-DIFFERENTIAL EQUATION AND APPLICATIONS OF WAVELETS IN MECHANICAL ENGINEERING" submitted by Reg.No.19S14114, Mr. SACHIN C SAUNSHI of fourth semester M.Sc. in Mathematics course to the Karnataka University, Dharwad for the award of the degree of M.Sc. in Mathematics, is a result of M.Sc., project work carried out by him under my guidance. This project is submitted in partial fulfillment of the requirement for the award of Master's Degree in Mathematics during the academic year 2020-2021.

## Place: Dharwad

Dateiz0/07/2021

Project Guide
Prof. S. C. Shiralashetti
Dr. S. C. SHIRAEASHETTI
 Profess of
Deparment of Mathematics 1) yatak:University, Dharwad 580003

